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REPORT OF CHIEF OF BUREAU OF BIOLOGICAL SURVEY.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., September 4, 1919.

SIR: I have the honor to submit herewith a report on the work of the Bureau of Biological Survey for the fiscal year ended June 30, 1919.

Respectfully,

E. W. NELSON,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

WORK OF THE BUREAU OF BIOLOGICAL SURVEY.

The activities of the Bureau of Biological Survey are conducted under four divisions: (1) Investigations of the food habits of North American birds and mammals in relation to agriculture, in charge of Dr. A. K. Fisher; (2) biological investigations, with special reference to the habits and geographic distribution of native animals and plants, in charge of E. W. Nelson; (3) supervision of national mammal and bird reservations, in charge of Dr. G. W. Field; (4) administration of the migratory-bird treaty act and enforcement of the Lacey Act regulating the importation of birds and the interstate shipment of game, in charge of George A. Lawyer.

ECONOMIC INVESTIGATIONS.

Largely increased war emergency funds were added to the regular appropriation during this fiscal year for the campaign against predatory animals and injurious rodents. As a result, the work was more thoroughly organized and was conducted on a greater scale than during any previous year. The Federal funds available for this purpose amounted to $592,000. To this was added a total of more than $800,000 by States, counties, farmers and stock-growers' organizations, and individuals, in funds expended in cooperation with, and mainly under the direct guidance of, the Biological Survey. In addition to these funds, much material and the personal services of many thousands of farmers and stock growers were contributed to the field work, in assisting to destroy animal pests both on private lands and on Government lands adjacent to private holdings. In North Dakota about 42,000 farmers joined in the work and in Montana about 18,000. In other States cooperation was general and involved large numbers of men.

During the early part of 1919 the legislatures of Arizona, Colorado, Idaho, Nevada, New Mexico, North Dakota, Montana, Oregon,

California, Texas, Utah, and Washington made direct appropriations amounting to $688,000 to be expended in this work during the two following years in cooperation with the Biological Survey.

Wherever work has been undertaken the rapid growth of cooperative funds and the increase in the number of men participating furnish a practical demonstration of its success and usefulness. The bureau is in constant receipt of urgent requests for additional help far beyond the limits set by its available funds.

Estimates based on information supplied by farmers and stockmen indicate that the destruction of more than 32,000 predatory animals under the direction of the Biological Survey during the year resulted in a saving of live stock valued at approximately $5,000,000; and the destruction of prairie dogs and other rodents resulted in a saving of enormous quantities of forage, and also of crops valued at not less than $14,000,000.

PREDATORY ANIMALS AND RABIES.

Of the total funds available for the campaign against injurious animals, about $375,000 was provided for use in destroying wolves, coyotes, mountain lions, bobcats, and other stock-killing animals and for the suppression of wild animals affected with rabies. For the prosecution of this work, which began in 1915, the Western States have been organized into 10 districts, each with a trained inspector in charge, as follows: (1) Arizona, (2) California-Nevada, (3) Colorado, (4) Idaho, (5) New Mexico, (6) Montana, (7) Oregon-Washington, (8) Texas, (9) Utah, (10) Wyoming-South Dakota.

During the year a force of from 400 to 500 skilled hunters has been employed under the direction of the various inspectors. The salaries of a part of the hunters are paid from the Federal Treasury and of the others from cooperative funds supplied by the States or by contributions from local organizations and individuals. As heretofore, the hunters are not permitted to receive bounties, and the skins taken by each become the property of the Federal Government, the State, or the organization or individual providing the money for salary. Skins taken by Federal hunters during the year netted the Federal Government $76,128.56, which has been turned into the United States Treasury, making the total received by the Government from this source to date $197,387.37.

The number of skins or scalps of predatory animals taken by official hunters during the year is as follows: Wolves, 584; coyotes, 27,100; mountain lions, 149; bobcats, 4,123; Canada lynxes, 43; bears, 81. In addition, as a result of poisonous operations, so many dead coyotes are reported by stock growers to have been found on the ranges where poisoning operations were conducted that it is safe to estimate the number destroyed in this way as more than equaling the approximately 32,000 predatory animals of which the skins and scalps were taken.

Predatory-animal hunters are directed to consider bears under ordinary circumstances as game animals and have positive instructions to take every precaution not to kill any except those known to be destructive to live stock. Unfortunately, occasional unoffending bears are taken in traps set for other animals, thus making the number of bears killed during the year considerably larger than would

otherwise be the case. The vast majority of bears are inoffensive so far as injury to stock is concerned, but occasional individuals in all parts of the range country become stock killers, some of them being notoriously cunning and destructive in their activities. Naturally such animals must be eliminated, and the more promptly this is done the less prejudice there is likely to be created among the stock growers against all bears.

From much expert study and experimentation, great improvements in methods of poisoning predatory animals have resulted. Larger and more thoroughly organized poisoning campaigns than ever before attempted were conducted during the year. Their success was such that in many areas stock growers are urging the extension of this method as being the most practicable one for the control of coyotes. Extended poisoning operations were conducted in the great sheep-growing sections in Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming. This was followed by a marked decrease in the number of coyotes in the sections poisoned, with a corresponding decrease in the losses of sheep, cattle, pigs, colts, and poultry. Reports have been received from stockmen stating that on many important ranges and lambing grounds the former heavy annual losses have become negligible or have been entirely eliminated.

For a number of years rabies has been prevalent among predatory animals in California, Idaho, Nevada, Oregon, Washington, and Utah. A part of the money available for predatory-animal control has been appropriated for the specific purpose of destroying the wild animals affected with this disease in the States named. Although the disease still maintains a foothold in all of these States, efforts in suppressing its carriers have been so successful that its spread to other States has been prevented, and the number of domestic animals and persons bitten by rabid wild animals has steadily decreased until at present the number is very small. When an outbreak of the disease occurs in any district, hunters are immediately concentrated there, so that the wild animals carrying the rabies are summarily destroyed and the spread of the disease is promptly stopped.

The serious situation resulting from the outbreak of rabies before it was controlled is indicated by the fact that in the fiscal year 1915–16, when the principal outbreak in Nevada occurred, it was estimated that live stock in that State valued at about $500,000 were lost through being bitten by rabid animals. Some ranches lost from 200 to 400 head of cattle. Up to the present time approximately 1,500 persons are known to have been bitten by rabid animals and treated for the disease, and at least 47 are known to have died from it. Without Federal intervention for the suppression of rabies, the ravages brought about by it would have been vastly increased. Furthermore, it should be borne in mind that with the disease still persistent in scattered localities throughout the territory where it was once generally prevalent, the removal of organized preventive measures would at once result in its renewal and spread throughout the western range States.

Special efforts are being made by inspectors of the bureau to destroy individual predatory animals which have become notorious for their stock-killing exploits in various States. Near Dubois,

Wyo., a mountain lion was killed in the spring of 1919 which was known to have destroyed $1,000 worth of live stock last October and to have killed a number of cattle during the winter. This was a much-hunted and battle-scarred animal which had been wounded a number of times by private hunters. Another mountain lion taken in April had killed seven colts during the spring. In the same State a pair of wolves were killed—the female by a Government hunter and the male by a private hunter—which had destroyed more than $2,500 worth of stock during the preceding year. The owner of a ranch near Mertzon, Tex., reported that in less than three months his losses amounted to nearly 300 sheep, valued at $3,200, caused by 6 coyotes which one of our hunters captured during July. In western Colorado, in an area about 75 miles in diameter which was poisoned two successive years, through cooperation between local stock growers and the bureau, sheep owners reported formerly a loss of about 25 sheep a day throughout the season, but the destruction of predatory animals has been so thorough that at present the losses are nominal, and sheep are reported to range freely, sometimes unattended for several days in succession, without loss. In New Mexico the wolves, which were estimated to number between 300 and 400 at the time the campaign began there, have been reduced to less than 30 individuals, and this number is being steadily decreased by the persistent campaign against them. These remaining wolves are mainly experienced adults, causing annual losses of live stock amounting to about $2,000 each. In southern New Mexico the stock of wolves is constantly renewed by stragglers from the mountains of northern Chihuahua. In addition to the ravages from the native predatory animals, live stock in parts of Texas, Arizona, and other States suffer from depredations by dogs which have gone wild and have taken up the predatory life of wolves. In some places the dogs join the wolves, and the half-breed offspring increase the packs.

RODENT CONTROL.

As in the previous fiscal years, the war emergency need for increasing the food output caused the bureau to concentrate its campaign against injurious rodents about farm areas. As heretofore, the effectiveness of this work was greatly increased by the cooperation of the States Relations Service of the Department of Agriculture and of the extension services of State agricultural colleges. The county-agent organization of the latter, in greatly enlarging the educational campaign, brought about a public appreciation of the enormous losses from the depredations of rodents and secured the cooperation of the farmers on a large scale. As a consequence the most vigorous and successful drive yet made was conducted against the myriads of prairie dogs, jack rabbits, field mice, and other rodent pests which seriously decreased the output of grain, alfalfa fields, and orchards and lessened the value of truck and garden crops, as well as of forage on the stock ranges throughout the West.

Cooperative campaigns with local organizations and individuals were conducted in Arizona, California, Colorado, Georgia, Idaho, Kansas, Maryland, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and

Wyoming. Preliminary conferences were held in reference to the organization of similar work in Iowa, Minnesota, and Texas. Investigations for bettering the methods of destroying injurious rodents as well as improving the organization are being conducted, and the work is becoming increasingly effective.

Field investigations through inclosed trial plots for the purpose of securing accurate data as to the destruction of forage by rodents on the open range have been continued during the year in cooperation with the Forest Service, the State University of Arizona, and the Carnegie Institution of Washington. Interesting and valuable results are being secured.

The demands from the States for increased activities in rodent-control work, and the money offered by States and counties for cooperative purposes, are far greater than the bureau can possibly meet with its available funds. The opportunity for useful expansion in this work is obvious in view of the fact that native rodents destroy each year field crops and forage worth approximately $300,000,000, while the losses from house rats and mice approximate nearly $200,000,000, a large proportion of which can be eliminated at moderate cost.

Through a system of contracts the bureau has been able to assist the States in securing poison supplies for use in rodent campaigns at a discount amounting to many thousands of dollars, thus increasing the effective use of their funds.

PRAIRIE DOGS.

Prairie dogs occupy more than 100,000,000 acres of public and private lands. Wherever they occur in abundance they are exceedingly destructive to cultivated crops and to forage on the open range. In cooperation with the extension services of the agricultural colleges in Arizona, Colorado, Montana, New Mexico, North Dakota, Oklahoma, South Dakota, Utah, and Wyoming, the campaign against these animals has been pushed aggressively. In Arizona and New Mexico the State councils of defense joined actively in the work and contributed funds for the purpose. The participation of farmers and stockmen has been fuller than ever before, and the saving of crops and forage has been correspondingly great. During the year from 75 to 95 per cent of the prairie dogs were destroyed on nearly 2,000,000 acres of privately owned crop and forage lands and on more than 200,000 acres of public domain, the latter making more than 3,700,000 acres of public lands which have been largely freed from these pests. In many places private landowners were so interested that they volunteered their services to clear adjacent Government lands, the bureau supplying the poison to be used in the work. With cooperation of this character it will be possible to clear large areas of the public domain at almost a nominal cost to the Government.

GROUND SQUIRRELS.

Numerous species of ground squirrels occur in the West, several of them having such wide ranges and existing in such abundance that their depredations on crops and forage are most serious. As with the prairie dogs, continued investigations are being made to devise improved methods of poisoning and of organization for their destruction. The poisoned grain used for operations against ground squirrels on private lands is prepared under the supervision of field

representatives of the bureau and furnished cooperating farmers at cost through local organizations. In this way 1,349 tons of poisoned grain were prepared and distributed during the year, and nearly 110,000 farmers took part in the campaign.

Through the plan inaugurated by the bureau of cooperative purchase of poison supplies the saving in the squirrel campaign, as well as in the destruction of other rodents, has been very great, as illustrated in Idaho, where it amounted to about $18,500.

During the year ground squirrels were poisoned and mostly destroyed on more than 1,294,000 acres of public domain and on more than 13,465,000 acres of private lands. This resulted in materially increasing the percentage of crops harvested in all the States where work was conducted and in increasing the forage output on the public domain.

JACK RABBITS AND COTTONTAILS.

As in previous years, work was done to control the losses of crops, including wheat, barley, oats, beans, alfalfa, and others, from jack rabbits, particularly in Arizona, Idaho, Nevada, New Mexico, Oregon, Utah, and Washington. Wherever market and other conditions were favorable, jack rabbits were killed by drives and by trapping in order that they might be sold for food. In this way two counties in Utah, under the direction of a representative of the bureau, marketed 6,500 of these animals, besides the large numbers marketed independently. Effort is being made to develop the utilization of the meat and skins of these animals through standardized methods of dressing and marketing. In many places where it was impracticable to kill jack rabbits for market purposes extended poisoning operations were conducted, as in Idaho, where in this way 40,000 of these animals were killed in one county.

In addition to damage by jack rabbits, complaints have been received by the bureau of depredations by cottontails among fruit trees, and in truck and other agricultural crops. Complaints of losses from this source have been more numerous from the Eastern States, where demonstrations have been given to teach farmers the most practicable means of protecting their crops from these animals.

POCKET GOPHERS.

Pocket gophers are exceedingly injurious to root crops, peanuts, beans, alfalfa, hay meadows, grazing lands, and orchards. The seriousness of their depredations is indicated by an estimate made by a competent official of the Kansas Agricultural College that during 1918 they destroyed one-tenth of the alfalfa crop in that State. The alfalfa crop of Kansas for that year was valued at $50,000,000, so that the damage by pocket gophers to this crop alone amounted to about $5,000,000. In view of the fact that these animals also do extensive damage to orchard and other crops, the injurious character of this pest is evident. Pocket gophers have a wide distribution in practically all of the States from the Mississippi River to the Pacific coast. On some of the most productive grazing lands on the national forests they seriously reduce the forage production. Methods of destroying these animals adapted to use in extensive community campaigns have been much improved during the year.

Pocket gophers not only damage established crops, but frequently interfere with the introduction of new and valuable crops. This was

well illustrated at Hearne, Tex., where the quarantine against the pink cotton boll worm prevented the growing of cotton. The State agricultural college planned to foster the planting of peanuts as an important food and feed crop, but this was found to be impracticable on account of the abundance of pocket gophers. At the request of the agricultural college, an experienced representative of the Biological Survey was detailed to assist in organizing a community campaign against these animals. Farmers and business men joined heartily in the work, with the result that every pocket gopher in the area treated was reported killed, and an excellent crop of peanuts was planted and harvested.

MOUNTAIN BEAVERS AND WOODCHUCKS.

The investigations were continued into the habits of the mountain beaver, or sewellel, a curious rodent living in the humid region of the Northwest coast. With the development of agriculture in its region this animal, which was formerly considered harmless, has become increasingly injurious to crops, particularly to small fruits and to market produce. Methods for its control have been devised, and demonstrations were made by a representative of the bureau in various localities in Washington and Oregon where there was need for the adoption of active measures.

Woodchucks have continued to be a source of annoyance and loss to gardeners and truck growers throughout the northern and northwestern sections of the country. In many parts of the Northwest the planting of alfalfa and clover and of other succulent crops has attracted the attention of woodchucks, which have concentrated about these new sources of food supply, with attendant losses to the farmer. In some of the Northwestern States where the woodchucks live in the rocks adjacent to cultivated fields, strips of alfalfa and clover several hundred feet wide along the borders are often completely destroyed. It was found that the methods of destroying these animals used successfully in places where they live in burrows in the open country were not effective in this region. Successful methods were here developed, however, and as many as 55 woodchucks have been killed in a single field demonstration.

NATIVE MICE, WOOD RATS, AND COTTON RATS.

Widespread damage to orchards by the depredations of native mice continue to be reported, the most conspicuous occurring in the States of Virginia and Washington. In Winchester County, Va., the loss is reported of more than $200,000 by pine mice, which gnaw the bark from the roots of orchard trees. Demonstrations have been given for the control of these pests.

In Florida surprisingly successful experimental plantings of sugar cane on a considerable scale have been made within the last two years, but during the year reports have been received of extensive damage to the cane by rodents which destroy the seed cane and cut the growing stalks. So serious has been this damage that the principal company interested in the development of the sugar-cane industry in that State has written the bureau that unless some method can be found for successfully controlling the cane-destroying rodents the development of the industry there will be impossible. Losses of from 40 to 60 per cent of the growing cane

have been reported. The depredations are by the cotton rat, a small ratlike rodent limited to the South Atlantic and Gulf States. Investigation has determined effective methods of poisoning these rodents, and it is believed that through demonstrations and advice the growers will be able to control the rats and reduce the losses to a negligible amount.

Wood rats continue to be troublesome in limited areas, and where they become especially injurious demonstrations and advice have been given for their control.

HOUSE RATS AND MICE.

The extended educational campaign inaugurated last year was continued in order to acquaint the public with the serious drain on the Nation's food resources through depredations of house rats. Demonstrations were given of methods of poisoning and trapping the animals, and plans for community organization against them were presented and discussed. As a result many State officials, State councils of defense, and public-spirited citizens took up the work of organizing campaigns, and great numbers of the rodents were destroyed.

Requests were made by military and naval officers in charge of camps, arsenals, and storage warehouses in this country for advice and assistance in controlling house rats in the buildings under their control. Experienced representatives were detailed to investigate conditions and recommend plans for limiting the losses. Gratifying results were obtained, perhaps the most important of which was at the Bush Terminal warehouses in Brooklyn, N. Y. These great warehouses were taken over by the Government for Army quartermaster storehouses, and were so badly infested by rats as seriously to endanger the stored food and other Army supplies. At the request of the quartermaster officer in charge, a representative of the bureau made a survey of the warehouses in January, 1918, and recommended a method of procedure for controlling the rats. At the end of the year the quartermaster officer in charge advised that the recommendations of the bureau had been followed with complete success. He reported that at first practically a barrelful of rats were killed each day, and that more than 35,000 rats were killed during the year. The work of destruction was so thorough that he reports the losses of military supplies during the entire year to have been negligible.

Large numbers of the Farmers' Bulletin (No. 896) giving information concerning the destruction of rats were used in this country by the Quartermaster Department of the Army and also in France in an effort to control losses from these animals.

In this connection it may be stated that several experts in rodent control who were commissioned in the Sanitary Corps of the American Expeditionary Forces in France for the purpose of controlling the depredations of rats in connection with the Army operations, were highly successful in preventing heavy losses of quartermaster stores from these rodents.

MOLES.

Throughout the year demonstrations were continued in Washington and Oregon for the control of the large moles which are a serious pest to agriculture in that region. The fur value of these animals

having been established among fur dealers through the efforts of the Biological Survey, the price of their skins continues to advance. In cooperation with extension services and other agricultural agencies in their territory, demonstrations of methods for capturing the animals and preparing their pelts for market were continued. Successful boys' and girls' clubs were organized to trap them and to cooperate in selling the skins. As a result the members of the clubs learned a valuable lesson in cooperative work, not only in ridding fields of a pest, but also in marketing, the sale of the skins netting them the substantial sum of more than $50,000.

DOMESTIC RABBITS.

The high cost of meat during the war and the scarcity of rabbit skins for manufacturing felt hats and cheap grades of furs combined in emphasizing the opportunity in this country for the profitable production of rabbits. In Europe the growing of domestic rabbits has long been an industry of considerable importance conducted on a small scale by numberless individuals, and it has already been abundantly proved that domestic rabbits do equally well in the United States. Not only is their meat of excellent quality, but their fur is of value also; recently these furs have been manufactured on a considerable scale, dyed and in their natural colors, and are frequently most attractive in appearance.

Under ordinary conditions the rearing of domestic rabbits will give a quick and economical supply of meat, one that can be produced cheaper than that of the domestic fowl; while the skins of selected stock are of sufficient value to render them an important part of the returns. A growing interest has been shown in the bulletins and other publicity from this bureau designed to encourage the growing of these animals on farms and in back yards. National and State rabbit breeders' associations are now well established; clubs and associations are being organized and periodicals developed to increase rabbit growing; and many boys' and girls' clubs have taken up the enterprise. It is believed that through these methods a great increase in the development of this young industry may be brought about.

With a view to fostering the production of these animals along practical lines investigations have been continued among the breeders of the country and among those dealing in the skins and manufacturing the furs. An article on rabbit growing to supplement the meat supply was published in the Yearbook of the Department for 1918, and a bulletin is now in process of preparation to supersede the Farmers' Bulletin (No. 496) on "Raising Belgian Hares and Other Rabbits."

FUR-BEARING ANIMALS.

Investigations concerning fur-bearing animals have been continued and the annual bulletin on laws relating to these animals was issued. The animals now held at the experimental fur farm in Essex County, N. Y., include minks, martens, fishers, skunks, raccoons, and rabbits. Experiments in inclosures for these animals, as well as in feeding and breeding them, and investigations concerning the parasites and diseases to which they are subject, are in progress.

Two graded Saanen goats have been furnished by the Bureau of Animal Industry for use at the farm to provide milk for feeding the fur animals and to keep down weeds in the animal yards. Domestic rabbits are also being grown at the farm in order to supply the fur bearers, especially the breeding females, with fresh meat. The keeping of a few domestic animals at the fur farm has necessitated a limited amount of farming there to produce feed in the form of hay, oats, buckwheat, corn, carrots, and turnips. A building to shelter the rabbits and goats and to store feed for them has been completed during the year, and ground has been cleared and material assembled to build yards to accommodate four pairs of cross foxes.

An inquiry concerning the supply of furs from wild fur-bearing animals has been addressed to a large number of raw-fur dealers throughout the United States, including Alaska. This has developed the fact that there has been an alarming reduction in the number of skins coming to the market during the last decade, and that there is a general demand for short open seasons on fur-bearing animals, and particularly for better enforcement of State laws against trapping fur-bearing animals when their fur is not prime.

Most States now have laws protecting fur bearers during at least a part of the year. Up to within a recent time most of the fur bearers, including such species as the skunk and the mink, have been considered pests, because they at times raid chicken coops. The apparently infrequent damage done by these animals is negligible as against their great value. The skunk feeds largely on field mice and insects and has become one of our most valuable fur bearers. The Commissioner of Conservation of New York reports that during 1918 skunk skins taken in that State brought more than $1,000,000 in the fur market. There is no State in the country which can not greatly increase the natural resources represented by its fur-bearing animals by proper protective laws and their enforcement.

ECONOMIC ORNITHOLOGY.

Article VII of the migratory-bird treaty between Great Britain and the United States reads as follows:

> Permits to kill any of the above-named birds which, under extraordinary conditions, may become seriously injurious to the agricultural or other interests in any particular community, may be issued by the proper authorities of the High Contracting Powers under suitable regulations prescribed therefor by them, respectively, but such permits shall lapse, or may be canceled at any time when, in the opinion of said authorities, the particular exigency has passed, and no birds killed under this article shall be shipped, sold, or offered for sale.

The administration of the act of enforcing the treaty as a consequence of this article has caused a notable increase in the demand for economic ornithological work. Numerous reports of bird depredations have been made, and in some of the cases investigated recommendations for the control of the species have been made, while in others the complaints proved to be without basis to warrant action. The incentive for large crop production incident to the war has been an added cause for the receipt of more than the ordinary number of complaints concerning bird depredations. A policy of bird conservation that will best serve the interests of the farmer involves not only a thorough appreciation of the value of beneficial species, but adequate attention to the control of troublesome ones. Consequently,

now that the beneficial species are fortified by ample protective legislation, the importance of perfecting methods for protecting crops against damage by birds becomes apparent.

FISH-EATING BIRDS.

Continuing the work started last year in investigating the food habits of fish-eating birds, field work was conducted in Florida to ascertain the relation of pelicans to the fishing industry. Claims had been made that these birds were responsible for the reduction in the numbers of mullet noted in recent years, as well as for the destruction of other food fishes. It naturally followed that the protection of the brown pelican in the breeding colonies, which are maintained as bird reservations, was criticized. The habit of young pelicans, in common with some of the other fish eaters, of regurgitating their food when disturbed, permitted the examination of the stomach contents of several hundred of them without killing a bird. Of the 814 fish found in the material examined only 9 (7 mullet and 2 red fish) were of species valuable as human food. By far the largest item, comprising over 91 per cent of the food, consisted of menhaden, a nonfood fish occurring in great abundance in the shallow waters about Florida and along the Gulf coast. Adult pelicans, however, are at times a nuisance about gill nets, where, in their attempts to secure the enmeshed fish, they tear the seines.

Reports of destruction of trout by mergansers, or fish ducks, in Michigan were investigated, but the mildness of the past winter presented conditions tending to keep these birds out of the smaller streams where the damage is usually done. This matter must be investigated under more nearly normal winter conditions to determine accurately the amount of loss from this source. A report on the economic status of all our fish-eating birds is nearly ready for publication.

NIGHT HERONS IN LOUISIANA.

In Louisiana the night herons had been charged with being a menace to the frogging industry, and for that reason permission was asked to shoot them, as had been done prior to the enactment of the migratory-bird treaty act. Louisiana is the only State wherein night herons had ever been widely considered as legitimate game and a source of food. Among the French-speaking people of some sections the young of these birds are considered a great delicacy, and "gros-bec" hunting has been a favorite sport in the cypress swamps of La Fourche, Terrebonne, St. Marys, and neighboring parishes. An expert made a careful study of the birds in their haunts and after examination of a large number of stomachs reported that these birds are in no way a detriment to the frogging industry. It was proved that more than 96 per cent of the food in the stomachs of the night herons examined consisted of crawfish, and not a single frog was found. These birds were mainly the yellow-crowned species (*Nyctanassa violacea*), but previous examinations of stomachs of the black-crowned night herons showed that they had similar habits.

WHITE-WINGED DOVES IN ARIZONA.

Complaints by grain raisers of Arizona against the white-winged dove also necessitated investigation, chiefly in Maricopa County, where about 30,000 acres of wheat and barley had been planted. It

was found that the doves were very abundant and that by far the greater part of their food was secured from the waste grain dropped among the stubble. The birds seemed to prefer feeding there even though shocks or stacks of grain remained in the same field. In small fields, especially those located near large breeding or roosting colonies, the damage is sometimes very serious. In such situations it will probably be necessary to permit the killing of birds actually damaging crops.

BLACKBIRDS IN OHIO.

A study of the food habits of red-winged blackbirds in northeastern Ohio, where sweet corn is grown extensively, determined the fact that these birds are a menace to the crop. The damage is of a most annoying character, as the attacks are made when the crop is nearly ready to harvest. The birds tear open the husks and feed on the terminal kernels, thus making the corn unsalable. Field corn also is similarly damaged. Effective control measures were devised for fields of small size and for garden patches, but for large areas more economical measures must yet be discovered. It has been found that with care and with proper baits strychnine may be used against blackbirds with very little danger to other wild or domestic bird life.

BOBOLINKS, OR "RICE BIRDS," AND THE RICE CROP.

A complaint coming from the lower Delaware Valley regarding depredations by bobolinks, "reedbirds," or "rice birds," was investigated and found to be without foundation, but a continuation of this investigation in the South Atlantic States indicated that these birds are as destructive to rice as ever wherever opportunity offers. On their northward migration they do great damage to newly-sprouted rice and on their southward journey they raise havoc with rice in the milk. Untold thousands of these birds swarm in dense clouds over rice fields, where they may ruin the crop in a few hours. It was found that the losses to rice growers from these birds in the fall of 1918 amounted to about $150,000. In consequence of this an open season on bobolinks has been declared, which will have a tendency toward breaking up large flocks and reducing their numbers. In New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia these birds may be shot from September 1 to October 30, inclusive, and in Virginia, North Carolina, South Carolina, Georgia, and Florida from August 16 to November 15, inclusive.

DAMAGE TO RICE BY WILD FOWL.

In the fall of 1917 many complaints were received of damage by wild ducks to the rice crop of the Sacramento Valley, Calif. Investigation was begun by an expert of the bureau as soon as the rice began to head the following August and continued until the harvest was well under way in October. Rice in this region is grown largely on low-lying and more or less alkaline lands unsuited for other forms of cultivation and therefore previously unutilized for agriculture. Considerable numbers of pintails and mallards breed in the marsh and slough areas, and late in summer many other birds congregate there, attracted by the water and food. On moonlight nights pintails come to the rice fields in large flocks to feed. Experiments were made with various means of driving out the birds. It was found that arming men with guns and stationing them in the fields

was one of the best methods, supplemented by occasional aerial bombs that exploded among the birds and frightened them as they rose from the rice. As these ducks are protected under the migratory-bird treaty act, a special order was necessary granting permission to rice growers to kill them before the opening of the hunting season on October 16; after that date rice growers were permitted to shoot at night in fields still containing rice. These measures resulted in a saving of not less than $125,000 worth of grain, while the number of ducks destroyed was nominal.

In November investigation was made of conditions in the rice district of Arkansas. Owing to unfavorable fall weather, probably two-thirds of the rice crop was unharvested as late as November 25. Migratory ducks, mainly mallards, were then arriving from the north and threatening serious damage. While the hunting season had opened, it was necessary to guard the fields at night, so that a special order had to be made under the migratory-bird treaty-act regulations, allowing rice growers to kill ducks at night.

MEADOWLARKS AND SPROUTING CORN.

The relation of the meadowlark to sprouting grain was a subject of field study in South Carolina. Reports received from most of the South Atlantic and Gulf States indicated that the food habits of the bird in the South were quite different from those it possesses in the North and that it was inflicting severe damage on sprouting corn. During March and April it was found that migrating flocks of these birds were spending a large part of their time in cornfields, feeding on the sweet germinating kernels, secured either by pulling up the sprouts or by making conical borings down to the grain. To afford farmers proper relief permission will have to be given them in certain areas to drive the birds from the fields with shotguns if necessary.

Similar complaints against mourning doves were not substantiated.

DESTRUCTIVENESS OF EAGLES.

From year to year definite and authentic reports are being received on the destruction of young fawns and wild turkeys, and even of young calves in some parts of the West, by golden eagles. Similar reports of the habits of both the golden and the bald eagle in relation to game come from Alaska. It is evident that these powerful birds are seriously destructive at times and their unlimited protection is probably not warranted.

IMMUNITY OF QUAIL AND GROUSE TO STRYCHNINE POISONING.

Important evidence has been secured regarding the comparative immunity of quail to strychnine poisoning. Field observations and feeding experiments conducted in California showed that one valley quail can eat grain containing enough strychnine to kill 12 ground squirrels without showing the slightest ill effect from the poison. A number of similar experiments on a mountain quail and a bob-white gave like results. The information thus gained will tend to allay fears in certain quarters that poisoning campaigns against ground squirrels result disastrously to these valuable game birds. Investigations in Saskatchewan, Canada, have proved that grouse are equally immune to strychnine poisoning.

FOOD HABITS OF OTHER BIRDS.

With a view to ascertaining the food habits of the vireos, examination of stomach contents has been continued and completed for all but one species; similar work has been started on the English sparrow, that its relation to constantly changing agricultural conditions may be known; and examination of the food of other species has progressed so far as a limited force permitted.

During the year two department bulletins were published, Attracting Birds to Public and Semipublic Reservations, and Food Habits of the Mallard Ducks of the United States, and several Farmers' Bulletins were revised. A report has been prepared on the food of winter-bird visitants, including the pine and evening grosbeaks, white-winged and red crossbills, hoary and common redpolls, pine siskin, snow bunting, the various longspurs, and the pipits. Another has also been prepared on the food of shoal-water ducks, dealing with the gadwall, baldpate, green-winged, blue-winged, and cinnamon teals, pintail, and wood duck. For educational purposes a lecture with lantern slides has been prepared on the value of birds to agriculture.

BIOLOGICAL INVESTIGATIONS.

The work of the Division of Biological Investigations has been seriously decreased, owing to the war. Two members of the scientific staff were commissioned in the Sanitary Corps and were in charge of rat-control work in France to safeguard Army supplies, and others were detailed to certain phases of urgently needed economic work.

As has been the case during past years, the field and laboratory work of the division has been conducted along broad lines helpful to the various other activities of the bureau. These activities include the enforcement of the migratory-bird treaty act; enforcement of the Lacey Act regulating importations of, and interstate commerce in, birds and mammals; the administration of the mammal and bird reservations; general conservation of game birds and mammals; and work relating to the economic relations of mammals and birds to agriculture, forestry, and stock-raising.

The card indexes covering the distribution, abundance, and habits of all the species of North American mammals and birds have been greatly augmented during the year. These files contain data from many sources, including reports by field parties of the bureau, notes gleaned from correspondence and other outside sources, and records from publications.

DISTRIBUTION AND MIGRATION OF BIRDS.

Owing to war conditions fewer volunteer observers than usual reported on bird migration. However, 250 observers sent in reports from points throughout the United States and from many localities in Canada and Alaska. Considerable progress was made in compiling information from various publications on the distribution and migration of birds, adding materially to the files, which now contain more than 1,350,000 cards. This source of information is consulted daily in connection with the administration of the migratory-bird treaty act and the investigations of the economic habits of birds.

BIRD COUNTS.

Reports of the fifth annual series of counts of birds breeding on selected areas in various parts of the United States were received from 84 persons, who reported on over 100 different areas. Many of these counts, made on areas previously reported on, showed an increase in bird population. Owing to the unusual conditions throughout the country, on account of the war, many persons who had formerly taken part in the annual bird counts were unable to find time for this extra duty. With the gradual return of normal conditions, however, it is confidently expected that a large increase will occur in the number of these volunteer observers.

BIOLOGICAL SURVEYS OF THE STATES.

Good progress was made in the field work in Arizona, Florida, Montana, Washington, and Wisconsin, continuing the biological surveys which have been in progress during the past few years.

The "Mammals of Panama," one of the results of a cooperative biological survey of the Canal Zone in 1911–12, is about to be issued by the Smithsonian Institution. Works completed, but not published, include List of Mammals of New Mexico, The Mammals of North Dakota, The Mammals of Wyoming, The Birds of Texas, The Birds of Alabama, and The Birds of New Mexico. Negotiations are being conducted for the publication of the last three mentioned by the States to which the reports relate, and those on Alabama and New Mexico will probably be issued within a few months. A systematic study of the rice rats of North America was issued during the year.

BREEDING GROUNDS OF MIGRATORY WILD FOWL.

An investigation of the breeding areas of ducks in North Dakota, begun in June, 1918, was continued during July. During June, 1919, the breeding grounds of ducks and other wild fowl in central Nebraska were investigated in order to compare the results with those found to obtain during former years. A gratifying increase of breeding waterfowl is evident in these States owing to the protection they have in spring under the migratory-bird treaty act.

WILD LIFE IN NATIONAL PARKS.

In cooperation with the National Park Service, Department of the Interior, investigations of the distribution, abundance, and habits of birds and mammals of Yellowstone and Glacier National Parks have been conducted during the past few years. During the fiscal year just closed revised reports on the birds and mammals of these two areas were published by the National Park Service in their educational literature; an elaborate report on Glacier National Park, comprising annotated lists of all the birds and mammals known to occur there, was completed during the year and was published by the National Park Service. A similar report on the mammals of the Yellowstone National Park has been prepared.

RELATION OF RODENTS TO FORAGE PRODUCTION.

In the spring of 1918 field investigations to secure information concerning the damage to crops and forage by injurious rodents were begun in several western States. By means of fenced and unfenced

quadrats established on grazing areas where rodents abounded, studies of the damage inflicted by these pests were instituted. During the spring of 1919 a careful examination of these special areas was made and substantial progress in the elucidation of these problems has been effected. New quadrats were also installed. The results of this investigation will have great practical value in relation to forage on the western range lands.

MAMMAL AND BIRD RESERVATIONS.

The Federal big game and bird reservations in charge of this bureau, remain, as heretofore, 74 in number. Four are big game reservations; one, the Niobrara, created as a bird reservation, is used for both birds and big game; and 69 are bird reservations.

On June 30, 1918, the big game reservations contained a total of 368 bison, 274 elk, 54 antelope, and 21 deer, an increase in each species over the number reported last year.

The Government's seventh bison herd was established at Sullys Hill by the gift of the Park Commissioners of Portland, Oreg., of a nucleus herd of 6 animals. The Government's bison herds now aggregate about 950 head. Losses of antelope have been checked at the Wind Cave Reservation, S. Dak., and at the National Bison Range, Mont.

The number of visitors to the large game reservations is increasing, notably at Sullys Hill, Wind Cave, and at the National Bison Range. Trains on the new branch of the Northern Pacific Railroad from Dixon to Polson, Mont., now stop at Moiese close to the entrance to the main gate of the National Bison Range.

On the Gulf reservations arrangements were completed, as required by law (39 Stat., 1106), for assuming the full costs of warden service, formerly paid in part by the National Association of Audubon Societies. It became necessary also to purchase and maintain a patrol motor boat at Big Lake Reservation, a service formerly provided by the Arkansas Fish and Game Commission.

Under the protection of the wardens, the useful birds on all the big game reservations have notably increased, but particularly on the National Bison Range and the Winter Elk Refuge, incidental to the protection of these reservations for mammals.

MAMMAL RESERVATIONS.

Winter Elk Refuge, Jackson, Wyo.—The main purpose of this reservation, which now has an inclosed area of 2,760 acres, is to increase the forage for elk by a limited amount of cultivation. The first cutting of hay is stacked and fed to the elk when there is no available pasturage, and the remainder is left to be grazed by these animals. Besides the hay raised, 2,108 bushels of oats were harvested from 56 acres, incidental to preparing ground for alfalfa. In the spring this area was disked and seeded, and in addition 140 acres having an inferior stand of alfalfa were dragged and reseeded to increase the yield of hay.

At the beginning of the year the hay on hand totaled 755 tons, 120 of which was cut in 1917 and 635 in 1918. Because of the light snowfall over the entire region, the maximum number of elk coming down

at any one time to the refuge to be fed in the spring of 1919 was 3,000, as compared with a maximum of 10,000 for 1918. During 23 days of March (5th to 27th) 164 tons were fed to the elk, leaving a good supply on hand to supplement the harvest of this year. Some hay also was furnished by the State of Wyoming, and 25 tons of oat straw were fed to the elk.

No deaths from starvation were reported. A shortage of feed seems imminent for the coming winter, however, by reason of a severe drought. The drought has had the effect also of concentrating the ground squirrels around the irrigated areas, and as a result it has been possible to poison large numbers of them and thereby decrease their destruction of forage.

During the year somewhat more than 4 miles of new fencing was completed. The feeding corral built last year operated successfully and permitted segregating the young and weaker elk, thus protecting them from the main herd until they were fit to join it. Two cow moose visited the refuge on April 2.

The necessity for increased and definitely provided pasturage is immediate and imperative in order to deal justly with the settlers and to safeguard the existence of the elk. The precarious conditions surrounding the only two remaining large elk herds in the United States and a program for their conservation and for the action necessary to make them of the greatest value to the people are set forth in a department circular (No. 51), Our National Elk Herds, published in June in cooperation with the Forest Service.

National Bison Range, Moiese (near Dixon), Mont.—The inclosed area of this reservation totals 18,521 acres. It is stocked with the following: Bison, 290 head (including 48 calves); elk, 125 (not including young; antelope 33 (not including young); and mule deer, 13 (not including young). Of the bison, one crippled bull died, and one young calf was killed by an accident.

Serious forest fires threatened the range in August and again in May. Seven hundred acres of young pines and spruces were destroyed, but the fires were checked through the cooperation of the Indian and the Reclamation Services. Several incipient blazes were handled by the warden and assistants without serious loss.

Receiving basins 10 feet to 30 feet in diameter have been scooped out for conserving the water from the springs and making it accessible to the animals.

When the antelope "banded up" in the autumn the count disclosed but 32 as compared with 34 last year, probably the result of unlawful poaching in a remote part of the range. One doe was added by gift of the Oregon Game Commission.

Wind Cave National Game Preserve, S. Dak.—In the 4,160 acres inclosed on this reservation, the big-game animals number as follows: Bison, 52 (including 12 calves); elk, 85 (not including calves); and antelope, 21 (including 7 young).

Thirteen coyotes (two of which were inside the inclosure) and seven bobcats have been killed this year. The scanty water supply has been increased by the development of the Ottman well.

Sullys Hill Game Preserve, N. Dak.—About 700 acres of this reservation are now inclosed and contain the following: Bison, newly

established, 7 (including 1 calf); elk, 22 (not including calves); and deer, 6 (not including fawns).

Niobrara Reservation, Valentine, Nebr.—The big-game animals are at present held in two inclosures of about 200 acres each. The remainder of the reservation, about 4,500 acres north and about 9,000 acres south of the Niobrara River, is being inclosed in a stock-proof fence. The reservation is stocked with the following: Bison, 19 (not including calves); elk, 42 (not including calves); white-tailed deer, 2; Canada geese, 8. Pinnated and sharp-tailed grouse and other useful ground-nesting birds are increasing in numbers.

Two abandoned military structures are being salvaged for use in repairs of other buildings, and arrangements are being made for disposal under condemnation proceedings of the old "Administration Building."

A wire suspension footbridge has been built across the river, one dam constructed, and water from one spring conserved. By special efforts the prairie dogs were greatly reduced, possibly extirpated, thus saving considerable pasturage for the bison and elk.

BIRD RESERVATIONS.

On 10 of the 69 bird reservations, paid warden service has been maintained throughout the year, permanent warden service having been established at the Belle Fourche, S. Dak.; Big Lake, Ark.; and Strawberry Valley, Utah, reservations. At 8 other reservations part-time warden service is maintained during the nesting periods, the hunting season, or at times when serious trespass is likely to occur. Through the cooperation of the Reclamation Service, a general measure of protection is provided on most of the 19 bird reservations located within reclamation projects.

At the Minidoka Reservation, Idaho, a beginning has been made of making two islands of from 100 to 300 acres each, more attractive nesting and feeding places for useful birds, and important species of aquatic plants useful for food for waterfowl have been introduced into Lake Walcott. Certain projected and necessary improvements could not be carried out on account of labor shortage.

At the Belle Fourche Reservation, S. Dak., permanent warden service has been provided, warden's quarters have been constructed, and a large area suitable for nesting and feeding places for wild ducks has been protected by fencing.

At the Big Lake Reservation, Ark., substantial progress has been made in locating, straightening, and defining the boundaries. Reports from various outside sources indicate that the reservation is now serving the purpose for which it was established.

At Deer Flat Reservation, Idaho, projected improvements were postponed on account of unsettled conditions.

At the Malheur and Klamath Reservations, Oreg., deplorable conditions exist on account of uncertainty concerning the status of certain lands embraced within these reservations. These conditions are under investigation, and it is confidently expected that both these reservations, which are of world-wide fame as natural breeding places for birds, and which should be unique and valuable assets not only for the immediate locality but also for the Nation, will be permanently preserved for the public benefit, and not be sacrificed for the temporary advantage of a few interested persons.

On the Hawaiian Islands Reservation a warden resident at Honolulu has been appointed to keep the bureau informed regarding conditions there.

The reservations in Florida are very inadequate to preserve what formerly was the most wonderful bird population of North America. The time when effective action is practicable is rapidly passing. With proper measures taken at once for establishing extensive refuges in southern Florida, one of the most wonderful assets of the State and of the Nation can be preserved from annihilation.

Reservations about the Mississippi delta were utilized during the year in securing material for a study of the effect of fish-eating birds upon commercial fisheries. A representative of the bureau visited the breeding colonies of Caspian terns and brown pelicans on the Breton and Tern Islands reservations in June; the latter reservation, near the Pass à Loutre, is commonly known as the "Mud Lumps."

Increased protected areas suitable for breeding places for the migratory wild geese, ducks, cranes, swans, curlew, and shore birds should be provided. Additional wild-fowl refuges along the paths of migration are needed in order to secure improved and equalized opportunities for shooting wild fowl for food and for recreation, particularly in Iowa, Missouri, Kansas, and Illinois. All species of grouse and quail are also peculiarly subject to unnecessary and unwise depletion, which can best be minimized through reservations and provision of natural food supplies. The sage grouse requires special and immediate consideration.

There have been 28 convictions for violations of section 84 of the United States Criminal Code, prohibiting trespass on Federal bird reservations, with a number of cases still pending. Seven of these were for illegal shooting on the Malheur Lake Reservation, 19 on the Big Lake Reservation, and 2 on the Mosquito Inlet Reservation. It is hoped that these convictions will greatly strengthen respect for the law protecting the reservations.

THE MIGRATORY-BIRD TREATY AND LACEY ACTS.

The approval of the migratory-bird treaty act on July 3, 1918, to give effect to the treaty between the United States and Great Britain for the protection of migratory birds in the United States and Canada, concluded August 16, 1916, made possible the adequate protection of migratory birds in the United States. This act, which supersedes the migratory-bird law of 1913, contains many important provisions not found in the old law, especially those conferring on employees of the department appointed to enforce its provisions the powers of arrest, search, and seizure so necessary to its effective enforcement. Furthermore, the present act and the regulations thereunder contain many other new clauses covering the possession of migratory birds and the means by which they may be taken. It also provides for the collection and capture of birds for scientific and propagating purposes, as well as for the issuance of appropriate permits to kill any species of migratory bird found to be seriously injurious to agricultural or other interests.

The new law also supersedes the provisions of the Lacey Act with respect to the interstate shipment by common carrier of the dead bodies of wild birds and parts thereof, and adds new clauses pro-

hibiting the shipment or carriage of living as well as dead birds—migratory and nonmigratory—out of a State by any means whatever contrary to the laws of the State in which the birds were killed or from which they were carried or shipped. The provisions of the Lacey Act relating to the delivery to a common carrier for transportation of foreign animals and birds, the interstate shipment of wild animals and parts thereof, and the penalty for knowingly receiving illegal shipments still remain.

The first regulations under the treaty act adopted by the Secretary of Agriculture became effective on approval by the President July 31, 1918. Amendments to these regulations were adopted and became effective October 25, 1918.

The designation "district inspector," applied to those appointed to enforce the migratory-bird law of 1913, was changed to "United States game warden," and the office of chief United States game warden for the administrative officer directly in charge of the administration of the treaty act was created when the act became effective.

For the first year this act was administered with a force of only 15 full-salaried game wardens, and 45 deputy wardens paid when actually employed. Much assistance and cooperation was rendered by most of the State game departments, and about 150 United States deputy game wardens were appointed from the deputy State game wardens, who received only a nominal salary from the Federal Government.

The wardens employed by the bureau reported for prosecution 531 violations of the law. Convictions have been secured in 116 cases, in which fines were assessed ranging from $1 to $100 and costs, and aggregating $2,580. Of the remainder, 216 cases have been reported to the solicitor of the department for prosecution and are still pending; 5 cases have been dismissed by Federal judges; grand juries refused to return true bills in 15 cases, which probably will be resubmitted to grand juries or prosecuted by information; 79 cases are still under investigation; and prosecutions were abandoned in 100 cases, due mainly to the fact that the violations were of a trivial character or the violators had already been convicted and adequately fined in State courts.

Convictions were secured in Federal courts as follows: Alabama, 28; Arkansas, 12; California, 4; Delaware, 1; Florida, 15; Georgia, 2; Idaho, 6; Illinois, 9; Iowa, 4; Louisiana, 1; Maine, 1; Maryland, 1; Minnesota, 2; Missouri, 4; New York, 3; Ohio, 3; South Carolina, 11; South Dakota, 1; Tennessee, 6; Texas, 1; and Virginia, 1.

Reports received to date show that 58 violators of both Federal and State laws were apprehended by United States deputy game wardens and were successfully prosecuted in State courts and fined an aggregate of $1,918.75. The States in which these violations were prosecuted have thus benefited materially as a result of the cooperation of United States game wardens with State game authorities.

Wild ducks and other migratory birds of an approximate value of $2,942.25 illegally killed or possessed, and aigrettes and plumes of other migratory birds of an estimated value of $6,857.55 illegally possessed and trafficked in, have been seized. In most instances the birds seized which were fit for food have been released by the accused persons and donated to charitable or other public institutions and

much of the plumage seized has been turned over by the courts or the accused persons to the bureau to be used for scientific and educational purposes. The remaining birds and plumes are being held as evidence to await disposition by the court.

During the year 621 scientific permits and 465 propagating permits were issued. The number of propagating permits issued does not approximate the number of persons who captured or possessed and trafficked in migratory waterfowl during the year for propagating purposes. The law is new and most persons possessing such waterfowl have not as yet become familiar with its provisions. The public is rapidly learning the requirements of the law, however, and is showing a gratifying desire to comply with them.

Marked progress has been made in breaking up the illegal traffic in aigrettes. Aigrettes in the United States are mainly the plumes of the American egret and snowy heron, which birds have been exterminated in many of the rookeries and greatly reduced in numbers everywhere by plume hunters, who wantonly kill the birds during the breeding season.

The treaty act and the regulations thereunder make it unlawful to possess, purchase, sell, or transport aigrettes or the skins or plumes of any migratory birds except under permit for purely scientific purposes, but the skins and feathers of migratory game birds lawfully killed may be possessed without a permit. The wearing of aigrettes and plumes of migratory birds other than the feathers of migratory game birds lawfully killed is thus made unlawful, and it is believed that women will refrain from wearing aigrettes or other prohibited plumage as soon as they have become familiar with the provisions of the law. The market for these plumes will then be closed and a check placed upon the indiscriminate slaughter of these beautiful birds for their plumage.

The extent to which this illegal traffic has been conducted was indicated when United States game wardens armed with a Federal warrant searched the apartment of a Seminole Indian at Miami, Fla., and seized aigrettes valued at about $3,000. It is reliably stated that the yearly earnings of this Indian from the sale of plumes to Florida tourists and others have for several years exceeded $5,000. The Indian is now under bonds to await the action of the Federal court.

The constitutionality of the migratory-bird treaty act has been upheld by Federal courts in Arkansas, Missouri, and Texas. These decisions have removed to a large extent the doubt existing in some quarters concerning the validity of the act, and have been a decided deterrent to those inclined to violate the law.

In Illinois, Ohio, South Carolina, and South Dakota legislation was enacted bringing the State game laws into practical uniformity with the provisions of the migratory-bird treaty act and the regulations thereunder, making a total of 28 States that have conformed their laws for the protection of migratory birds to the Federal law and regulations. The laws of three other States are nearly in harmony with the Federal regulations.

Many species of migratory birds have had a marked increase under the existing treaty act. Waterfowl formerly driven to the far north by spring shooting have remained in steadily increasing numbers to breed in localities where few or none had previously nested for many years.

State game commissioners, sportsmen, and others have extended cordial support and cooperation in the enforcement of the law, and the general opinion prevails that the treaty act properly enforced will restore our migratory game birds to such numbers as will continue to afford abundant legitimate sport. At the same time there will be an increase in the useful insectivorous and other migratory nongame birds.

INTERSTATE COMMERCE IN GAME.

The designation "district inspector, interstate commerce in game," was changed to "United States game warden" when the migratory-bird treaty act, approved July 3, 1918, became effective, and the enforcement of the provisions of the Lacey Act was delegated to all United States game wardens—15 in number—but 4 of these wardens, who had been previously assigned solely to Lacey Act work, were continued during the year in the enforcement of that law. The remainder of the wardens devoted their time mainly to the enforcement of the treaty act, but rendered incidental services in the enforcement of the Lacey Act.

The increased number of wardens performing Lacey Act work has resulted in greatly increased activity in the suppression of illegal interstate shipments of game. During the year special efforts were made to minimize shipments of beaver and deer skins and deer. In this the bureau secured the cooperation of many responsible concerns dealing in furs and game. The high prices paid for furs have encouraged some trappers to capture illegally and ship beaver skins to the market, but, as a result of the bureau's educational work in regard to the law, many firms dealing in furs have refused to purchase beaver skins or to receive shipments from States that have a continuous close season on beaver. Many of these firms have not only discontinued sending quotations to trappers in States which prohibit the exportation of beaver skins, but have warned trappers not to consign to them beaver skins that have been illegally taken or shipped.

More than 1,000 interstate shipments of furs and game were investigated and 25 apparent violations of the Lacey Act were reported to the solicitor during the year. Of these violations, 12 were based on shipments which contained in the aggregate 27 carcasses of deer and 1,500 pounds of venison; 7 contained a total of 103 beaver skins; 2 contained 56 deerskins; 1 consisted of several shipments containing deer and elk hides; and 1 a shipment of aigrettes. Investigation of a large number of alleged illegal shipments is now in progress.

Violations of the Lacey Act reported for prosecution during the year to the solicitor originated in the following States: California, 1; Colorado, 1; Idaho, 1; Louisiana, 1; Maine, 5; Minnesota, 2; Montana, 2; New Hampshire, 4; Utah, 2; Vermont, 3; and Washington, 1. Twenty-three cases involving violations of the Lacey Act were disposed of in Federal courts. Seventeen prosecutions resulted in conviction of the accused and the payment of fines ranging from $2 to $1,000, the total amount of fines imposed being $1,917. The other cases were not brought to trial.

Seventy-six cases, many of them involving the shipment of beaver skins, which for various reasons it seemed undesirable to prosecute

in Federal courts, were referred by the bureau to State officials for prosecution in State tribunals. In 74 of these cases the accused were convicted and fines aggregating $3,085 were imposed. One offender was sentenced to 90 days in jail and another was paroled.

IMPORTATION OF BIRDS AND MAMMALS.

War conditions during the first half of the year exerted a marked influence on the importation of birds from foreign countries. Although the armistice was signed on November 11, 1918, restrictions on shipments were not removed until some months later, and even at the close of the fiscal year normal conditions had not been restored, so far as the trade in birds was concerned. Ordinarily the number of permits issued for the port of New York exceeds that for any other port, but this year, even including the permits for birds from Central and South American countries, it amounted to less than 7 per cent of the total. Very few shipments were received from Europe although two or three lots of canaries arrived from Liverpool, London, and Rotterdam, the Rotterdam consignment being the first from Holland since the early days of the war. The parrot trade with tropical American countries, which forms an important item under normal conditions, has only recently begun to revive, as shown by the receipt of two considerable consignments from Nicaragua and Colombia.

The number of permits issued during the year decreased about 10 per cent, from 300 in 1918 to 273 in 1919, and the number of inspections from 76 to 42. Many of the permits issued were for the entry of foxes from Canada, the total number being 335, as compared with 391 in 1918. At Honolulu permits were issued for the entry of 195 birds, including pheasants, and several miscellaneous cage birds. So far as known, no prohibited species were entered during the year.

During the latter part of October and the early part of November, reports were received to the effect that a contagious disease was prevalent on some of the fox farms on Prince Edward Island, and the issue of permits for the entry of foxes was temporarily suspended pending an investigation. Through the cordial cooperation of the Canadian authorities, an examination of conditions promptly made disclosed the fact that the malady was local and noncontagious. The precaution had the effect of assuring importers that the Department realized the importance of protecting their interests and effectually guarding against the introduction of any contagious disease.

The increase in the number of shipments received at San Francisco was marked and included not only birds from the Orient and Australia, but also for the first time some direct from the island of Java. For the first time in 20 years, the number of canaries imported from the Orient nearly equaled the number received from European ports. As was the case last year, the receipts of miscellaneous nongame birds included a number of rare species, particularly from the Orient and from Venezuela. Among the most interesting entries were several shipments from Java, one of which included a number of jay thrushes, reported as *Garrulax pectoralis*. The consignment from Rotterdam, which arrived in April, contained in addition to canaries and other song birds, 12 species of waterfowl and shore birds, including a number of European green-winged teal, garganey or

blue-winged teal, red-headed widgeon, and barnacle geese intended for exhibition in public zoological gardens or for propagation in private collections.

Among the rarer birds from Venezuela and Colombia were two Venezuela parrots (*Amazona barbadensis*), several bare-eyed robins (*Planesticus gymnophthalmus*), a puffbird (*Bucco bicinctus*), a cardinal (*Paroaria nigrigenis*), three black-necked screamers (*Chauna chavaria*), and several species of tanagers.

Reports of losses due to deaths among the birds en route were much more frequent than in any previous year. These were due in part to the long voyages from Australia and Java, but also to lack of care in handling the birds or packing them for shipment.

IMPORTATION OF QUAIL FROM MEXICO.

The regulations governing the importation of quail from Mexico remained in force without change during the past season, except that the time of entry was extended three weeks at the end of the season. The season was open in 1919 from February 15 to April 30. The ports of entry were the same as last year, Laredo and Eagle Pass, Tex., and New York City. Through cooperation of the Bureau of Animal Industry, the usual 10 days' quarantine was maintained at the two ports in Texas, and a thorough inspection of the birds was made during the period of detention. The first permit was issued January 8, 1919, and the number of quail for which permits were issued was 10,730, but the number released from quarantine was only 4,358, as compared with permits issued for 10,500 and the release of 5,205 in 1918.

Notwithstanding the fact that preparations were made long in advance of the season, both by importers and by several of the State game commissioners, to secure a large number of birds, the total number of quail secured was so small that only a fraction of the orders could be filled. The long-continued drought in the Southwest, and particularly in the States of Coahuila and Tamaulipas, where most of these quail are captured, appears to have so reduced the number of quail that it was impossible to secure birds to meet the demand. Comparatively few birds held died during the quarantine period, and no case of quail disease was reported.

INFORMATION CONCERNING GAME LAWS.

The regular annual publications, including a directory of officials and organizations concerned with the protection of birds and game, the nineteenth annual summary of game laws, and a general poster showing open seasons for game in the United States and Canada, were issued and were widely distributed. The special poster showing open seasons in North Carolina, where a multitude of local laws apply to particular counties, has been discontinued. Copies of all changes in State laws relating to game were received, carded, and indexed for reference.

The Summary of the Game Laws of the United States and Canada for this year is the nineteenth annual publication of this bulletin. It is of widespread interest among sportsmen and conservationists and is of much practical service. An edition of 100,000 copies was required to meet the demand and supply the necessary distribution.

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